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S2 EP8: A Guide to Galaxies

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EPISODE 8



**ASTROPHYSICS: DEEP IN THE SPACE
WITH MAANVINDER PILANIA**

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A Guide to Galaxies

Hello as this season is nearing to its end, welcome back to another episode of this podcast. I'm your host Maanvinder and in today's episode we're diving into the incredible world of galaxies and will talk about what they are, the different types, and some of the most famous galaxies in the universe. Join me as we uncover the secrets of these cosmic beauties. So, let's dive right in!

Before we get into the details, you should know that galaxies are enormous collections of stars, gas, dust, and dark matter, all held together by gravity. Think of a galaxy like a giant cosmic city, where stars are like houses and planets, moons, and other objects are like the people and cars inside. The largest galaxy known, IC 1101, is so big it can fit over 100 galaxies like our Milky Way inside it! This galaxy is so massive that it's about 6 million light-years across, and it's located around 1.04 billion light-years away from Earth in the constellation of Virgo.

Now that we know what a galaxy is, let's talk about the different types. In general, there are four main types of galaxies: spiral, elliptical, irregular, and lenticular galaxies.

Spiral Galaxies are the most well-known. Our very own Milky Way is a spiral galaxy! These galaxies are shaped like a flat disk with a central bulge, surrounded by spiral arms that wind outward. The arms are packed with stars, gas, and dust, while the central bulge contains older stars. Spiral galaxies often have a lot of star formation happening in their arms, and that's why they appear so bright and colorful. If you look at the sky, you might be able to spot some of the most famous spiral galaxies, like the Andromeda Galaxy. Andromeda is the closest spiral galaxy to us, and it's about 2.5 million light-years away. You can even see it with the naked eye on clear, dark nights, and in the future, our Milky Way and Andromeda will collide in about 4.5 billion years to form a single, much larger galaxy, often called Milkomeda.

Did you know that the Milky Way is thought to have formed around 13.6 billion years ago? That's almost as old as the universe itself! And when we talk about spiral galaxies, the Triangulum Galaxy is another great example of a spiral galaxy. It's smaller than the Milky Way and Andromeda but still contains around 40 billion stars.

Moving on to Elliptical Galaxies, these are shaped more like ovals or spheres and have no obvious arms. They tend to have a lot of old stars and very little gas and dust, which means there's not much star formation going on in them. These galaxies are more common in galaxy clusters, where many galaxies are packed closely together. The M87 Galaxy is a famous elliptical galaxy. It's huge, with billions of stars, and it's home to a supermassive black hole at its center! This black hole was even captured in the first-ever photograph of a black hole by the Event Horizon Telescope in 2019. M87 is about 53 million light-years away from Earth in the Virgo Cluster, and its black hole has a mass about 6.5 billion times that of our Sun. Another fun fact: Elliptical galaxies are often much older than spiral galaxies. Most of them have stopped forming stars and are just slowly fading over billions of years.

Next, we have Irregular Galaxies. As the name suggests, these galaxies don't have any defined shape like the spiral or elliptical galaxies. They can look messy or asymmetrical, often due to gravitational interactions with other galaxies. The Large Magellanic Cloud is a great example of an irregular galaxy. It's one of our closest neighbors, about 160,000 light-years away, and it orbits our Milky Way galaxy. Irregular galaxies can be full of young stars, and they often have

lots of gas and dust, meaning new stars are being born all the time. The Small Magellanic Cloud is another nearby irregular galaxy, and together, they are known as satellite galaxies of the Milky Way. Irregular galaxies are often rich in star-forming regions, making them some of the most fascinating galaxies to study. They often appear bright in infrared wavelengths, which is a result of young stars being born in large clouds of gas.

Finally, we have Lenticular Galaxies, which are a mix between spiral and elliptical galaxies. They have a disk-like structure, but unlike spiral galaxies, they don't have any spiral arms. They're kind of in between—old, but not quite as old and passive as elliptical galaxies. A good example of a lenticular galaxy is NGC 5866, located in the Virgo Cluster. These galaxies are relatively rare but can be found in the outskirts of galaxy clusters. Lenticular galaxies are unique because they might have once been spiral galaxies, but after losing their gas and dust, they stopped forming new stars, giving them an elliptical appearance. Some astronomers think that galactic collisions might be responsible for their transformation.

Now that you know the main types of galaxies, let's quickly touch on how galaxies form. Galaxies start off as clouds of gas and dust in space. Over time, gravity pulls these clouds together to form clumps, which eventually become stars. As these stars group together, they form galaxies. Some galaxies collide and merge, while others stay isolated, constantly growing and evolving. It's fascinating how galaxies are constantly changing and interacting with one another!

Galaxies can also be classified by their size. Some galaxies are dwarf galaxies, which are small but still contain millions of stars. Others are giant galaxies, which can contain hundreds of billions of stars, like our Milky Way. In fact, the Milky Way is part of a collection of galaxies known as the Local Group, which includes around 54 galaxies, including Andromeda, the Large and Small Magellanic Clouds, and other dwarf galaxies. No matter their size, all galaxies are incredible in their own way. A fascinating fact is that galaxies can also contain enormous structures called supermassive black holes at their centers. These black holes can be millions or even billions of times the mass of our Sun! They play a crucial role in galaxy formation and evolution. For example, the supermassive black hole in the center of the Milky Way is called Sagittarius A*, and it has a mass of about 4 million times that of our Sun.

So, the next time you look up at the night sky, think about how many galaxies could be out there. There are estimated to be over 100 billion galaxies in the observable universe, and each one is unique in its own way.

To wrap things up, galaxies are the fundamental building blocks of the universe. They come in all shapes and sizes, from the iconic spiral galaxies to the mysterious irregular ones. Whether they're forming new stars or holding ancient ones, galaxies tell us the incredible story of the universe's evolution.

Thanks for tuning in to today's episode! I hope this guide to galaxies helped you understand just how vast and diverse the universe is. See you in the next episode!

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